SECTION 13120

METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

B. Section 03300 - Cast-In-Place Concrete: Concrete slabs and footings.

C. Section 05100 - Structural Metal Framing: Metal wall and roof framing.

D. Section 05400 - Cold-Formed Metal Framing: Partition wall framing.

E. Section 13121 - Metal Wall Panels

1.2 SECTION INCLUDES

A. Metal Framing Components.

B. Metal Roof Panels and Trim.

C. Metal Building Accessories.

1.3 REFERENCES

A. AISC - American Institute of Steel Construction.

B. AISI - American Iron and Steel Institute.

C. AWS - American Welding Society.

D. ASTM A 36 - Standard Specification for Carbon Structural Steel.

E. ASTM A 529 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

F. ASTM A 572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

G. ASTM A 792 - Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

H. ASTM A 992 - Standard Specification for Structural Steel Shapes.

I. ASTM A 1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

J. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

K. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

L. MBMA - Metal Building Manufacturer's Association.

M. IAS - International Accreditation Service.

N. LGSI - Light Gauge Steel Institute.

1.4 DEFINITIONS

A. Traditional Metal Building System: A building system that will use either continuous or simple span "Z" purlins for support of the roof covering material.

B. Long Bay System (LBS): A building system that will use simple span, cold-formed, open web purlins to support the roof covering material.

C. Gable Symmetrical: A continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

D. Gable Unsymmetrical: A continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. The eave height and roof slope may differ on each side of the ridge. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

E. Single Slope: A continuous frame building which does not contain a ridge, but consists of one continuous slope from side to side. The building consists of straight or tapered columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

F. Lean-to (LT): A building extension, which does not contain a ridge, but consists of one continuous slope from side to side. These units usually have the same roof slope and girt design as the building to which they are attached.

G. Roof slope: Pitch expressed as inches of rise for each 12" of horizontal run.

H. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).

I. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.

J. Building Length: Measured from outside to outside of endwall secondary structural member.

K. Acrylic-Coated Galvalume: Galvalume with a light acrylic coating such as Galvalume Plus by Bethlehem, Acrylume by National or Galvalume Plus by U.S. Steel. This coating eliminates the need for roll-forming oil and reduces the incidence of field marking by handling or foot traffic.

L. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.

M. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.

N. Dead Load: The actual weight of the building system (as provided by Metallic Building Company) supported by a given member.

O. Floor Live Loads: Loads induced on a floor system by occupants of a building and their furniture, equipment, etc.

P. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.

Q. Roof Snow Loads: Gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.

R. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.

S. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

A. General

1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally recognized groups such as AISC, IAS, AISI, AWS, ASTM, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.

2. Design structural mill sections and welded up plate sections in accordance with the 13th edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ASD method or LRFD method.

3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", 2001 Edition with 2004 Supplement.

B. Design Loads

1. Specify design loads and set forth in the contract in accordance with the manufacturer's standard design practices. Design loads may include dead load, roof live loads, wind loads, seismic loads, collateral loads, auxiliary loads, floor live loads and/or other applied or specified loads.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.

F. Certifications: Shop drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by manufacturer upon request.

G. Bill of Materials: Bills of material shall be furnished and shall include item weights, if requested.

H. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

1.7 QUALITY ASSURANCE

A. Manufacturer / Fabricator Qualifications: All primary products specified in this section will be supplied by a single AISC - MB category certified Manufacturer /Fabricator with a minimum of ten (10) years experience.

B. Manufacturer / Fabricator Qualifications: All primary products specified in this section will be supplied by a single IAS certified Manufacturer /Fabricator with a minimum of five (5) years experience.

C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

D. Design: Standard drawings and design analysis must bear the seal of a registered professional engineer. Design analysis must be on file and furnished by manufacturer upon request.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation. Long term storage is NOT recommended.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty for 20 years against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Metallic Building Co., which is located at: 7301 Fairview ; Houston, TX 77041; Toll Free Tel: 866-800-6353; Tel: 713-466-7788; Email: request info (sales@metallic.com); Web: www.metallic.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01300.

2.2 MATERIALS

A. Primary Framing Steel:

1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A 36 or A 992, with minimum yield of 36 or 50 ksi.
2. Steel for built-up sections must conform to the requirements of ASTM A 1011, A 529, A 572 or A 36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
3. Pipe must conform to the requirements of ASTM A 53 Grade B with a minimum yield strength of 35 ksi.
4. Round Tube must conform to the requirements of ASTM A 500 Grade B with a minimum yield strength of 42 ksi.
5. Square and Rectangular Tube must conform to the requirements of ASTM A 500 Grade B with a minimum yield strength of 46 ksi.
6. Steel for Cold-Formed endwall "C" sections must conform to the requirements of ASTM A 1011 Grade 55, or ASTM A 653 Grade 50 with a minimum yield strength of 55 ksi.
7. X-bracing as required by the purchase order will conform to ASTM A 36 for rod and angle bracing or ASTM A 475 for cable bracing.

B. Secondary Framing Steel:

1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A 1011 Grade 55, or ASTM A 653 Grade 50 with a minimum yield of 55 ksi.
2. Design Thicknesses - Unless otherwise noted in these specifications, the following Design Thicknesses shall be used:
   a. Gauge: 16 - 0.059 Inches (1.50 mm).
   b. Gauge: 14 - 0.070 Inches (1.78 mm).
   c. Gauge: 13 - 0.085 Inches (2.16 mm).
   d. Gauge: 12 - 0.105 Inches (2.67 mm).

C. Roof Panels:

1. UL-580 Class 90, roll-formed acrylic coated Galvalume or pre-painted Galvalume.
2. Standing Seam Panels must have:
   a. (For US and Export) 50 percent minimum aluminum-zinc alloy- coating and conform to ASTM A 792 with a minimum yield of 50 ksi.
3. Finish: Fluoropon coating produced with either Kynar 500 or Hylar 5000 resins carrying a 20 year warranty.
4. Through-fastened panels must have:
   a. (For US and Export) 50 percent minimum aluminum-zinc alloy- coating and conform to ASTM A 792 with a minimum yield of 50 ksi.
5. Design Thicknesses - Unless otherwise noted in these specifications, the following Design Thicknesses shall be used:
   a. Gauge: 29 - 0.0133 Inches (0.338 mm).
   b. Gauge: 26 - 0.0181 Inches (0.460 mm).
   c. Gauge: 24 - 0.0223 Inches (0.566 mm).
   d. Gauge: 22 - 0.0286 Inches (0.726 mm).

D. Fasteners:

1. Eave: #12-14 x 1 1/4 inch (32mm) long life self-drilling with sealing washer.
2. Endlaps: #12-14 x 1 1/4 inch (32mm) long life self-drilling with sealing washer.
3. Ridge: 1/4 -14 x 7/8 inch (22mm) Lap Tek long life self-drilling with sealing washer.
4. Clips to Purlin: 1/4-14 x 1 1/4 inch (32mm) Tek 2 long life self-drilling with Hex Washer Head and 5/8 inch (15mm) O.D. washer.
5. Clips to Bar Joists - #12-24 x 1 1/4 inch (32mm) Tek 4.5 self-drilling with Washer Head and 5/8 inch (15mm) O.D. washer.
6. Long Life fasteners are used as a standard for all standing seam panels and on any through-fastened panel application for which a product warranty is desired.
7. Stainless steel fasteners and non-long life carbon steel fasteners for roof attachment are also available upon request.

E. Sealant And Closures:

1. Sidelaps: Factory applied, hot melt, foamable mastic - Q41A.
2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in roll form or pre-cut to length.
3. Outside Closures: Manufactured from the same materials as the roof panels.
4. Inside Closures: 18-gauge Galvalume or galvanized coated metal.

F. Wall Panels
1. Refer to section 13121 Metal Wall Panels.

2.3 PRIMARY FRAMING

A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections. Columns and rafters may be either uniform depth or tapered.

1. Frame Design: Gable Symmetrical.
2. Frame Type: Clear Span.

B. Endwall Frames / Roof Beams: Fabricated as mill-rolled sections, or built-up "I" sections depending on design requirements. Fabricate endwall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.

C. Finish: Red Oxide Primer, Gray Primer, or galvanized (pre coated galvanized cold form, hot-dipped otherwise).

D. Field Bolted Connections: All field bolted connections shall be designed and detailed in accordance with AISC Design Guides 4 and 16 as applicable.

2.4 SECONDARY FRAMING

A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI and LGSI. Purlin and girt flanges shall be unequal in width to allow for easier nesting during erection. They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin webs, not purlin flanges.

B. Purlins (Excluding Long Bay): Horizontal structural members which support roof coverings.

1. Maximum Length: To be determined by design.

C. Girts: Horizontal structural members that support vertical panels.

1. Depth: 8 inches (203mm).
   a. As required by design.
2. Maximum Bay Spacing: To be determined by design.

D. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.

1. Base channel.
   a. With flashing.

2.5 ROOF PANELS

A. BattenLok-HS: A mechanically seamed pan-type standing seam roof panel with concealed clips. Installed directly over purlins.

1. Gauge: 22.
2. Dimensions: 16 inches (406mm) wide by 2 inches (51mm) high.
3. Finish: As specified in Article PANEL FINISH.

2.6 ACCESSORIES

A. Light Transmitting Panels: Through-fastened translucent panel formed with the same profile of the roof panel in place of roof panel sheets to supply natural light to the building.

B. Louvers: Wall mounted accessory for allowing airflow into the building.

1. Size: As noted on the Contract Drawings.

C. Pipe Flashings: Aluminum base with EPDM boot. The base flange must bend to form a seal with surface irregularities or roof pitch.

D. Snow Guards: Provide manufacturer’s standard aluminum individual type snow guards at eave of all metal roofing. Attach to pan, not rib.

2.7 FABRICATION

A. General:

1. Shop fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
2. Shop connections must conform to the manufacturer's standard design practices as

defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.

3. All framing members must carry an identifying mark.

B. Primary Framing:

1. Plates, Stiffeners and Related Members.: Factory weld base plates, splice plates, cap plates, and stiffeners into place on the structural members.
2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricate webs to include bracing holes.
3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's AISC - MB category and IAS certifications. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.
5. Non-Destructive Testing (NDT) - NDT is not required on this project.

C. Long Bay Purlins:

1. Fabricate purlins from cold-formed open web Long Bay System assemblies with stiffened chords.
2. Designed as simple span. Connection bolts will install through the purlin seats. Pre-punch LBS assemblies to allow for attachment of frame flange brace angles, compression strut extensions and diagonal X-bridging at the centerline. Furnish all other bridging as light-gage cold-formed angles secured using self-drilling fasteners. Manufacture LBS sections in a facility that holds a current, valid MB Quality Certificate issued by the American Institute of Steel Construction.
3. Top and bottom chords of all LBS sections must have a nominal width of 4 inches (102mm) and be formed so that the top surface is continuous and flat to facilitate easy assembly of the roof system.
4. All elements of the LBS assembly must be a minimum of 16 gauge. The finished assemblies are subject to periodic testing to loads equal to 110 percent of the design loads.

D. Zee Purlins:

1. Fabricate girts from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Girt flanges must be unequal in width to allow for easier nesting during erection and pre-punched at the factory to provide for field bolting to the rigid frames.

E. Girts:

1. Girts must be simple or continuous span As required by design. Connection bolts will install through the webs, not the flanges.

F. Bracing:

1. Diagonal Bracing:
    a. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
    b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.
2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.
3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.
4. Bridging:
    a. Laterally brace the top chord of the LBS purlins with horizontal bridging if the roof system being used will not supply adequate lateral support to the top chord.
    b. Horizontally bridge the bottom chord for lateral bracing. One row of bolted diagonal bridging is required for all LBS purlins 40 ft. (12192mm) long and greater.

G. Standing Seam Panels - General:

1. One side of the panel is configured as female, having factory applied hot-melt mastic inside the female seam. The female side will snap over the male side and when seamed creates a continuous lock, forming a 360-degree Pittsburgh Seam.
2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.
3. Maximum panel length is 45 feet (13716mm) unless otherwise noted in the Contract Documents.

H. Endlaps:

1. Endlaps must have a 16 gauge backup plate and have the eight endlap joint fasteners installed in six pre-punched holes in the flat and in the dimples in the trapezoidal legs.
2. Apply mastic between the panels and secured with 1/4 inch (6mm) - #14 x 1 1/4 inch (32mm) self-drilling fasteners through the panels, and backup plate to form a compression joint.
3. "Through the roof" fasteners may only be used at endlaps and eaves.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION